WISCONSIN
HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE (HSEES)

CUMULATIVE REPORT 2002-2003

STATE OF WISCONSIN
DEPARTMENT OF HEALTH AND FAMILY SERVICES
Division of Public Health
Bureau of Environmental and Occupational Health

PPH 45087 (11/05)

CONTENTS

LIST OF FIGURES

Page

LIST OF TABLES

LIST OF APPENDICES

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For further information, contact:
James Drew, Coordinator
Wisconsin HSEES Program
Wisconsin Bureau of Environmental Health
One West Wilson St. Room 150
Madison, WI 53702
Phone: (608) 266-2663
Email: drewjm@dhfs.state.wi.us

EXECUTIVE SUMMARY

The Hazardous Substances Emergency Events Surveillance (HSEES) system, maintained by the Agency for Toxic Substances and Disease Registry (ATSDR), actively collects information to describe the public health consequences of releases of hazardous substances in 15 states. This report summarizes the characteristics of events reported to the Wisconsin Department of Health and Family Services (DHFS) during calendar years 2002 and 2003. Information collected about acute events involving the release of hazardous substances included, but was not limited to, substance name and quantity, number of victims, number and types of injuries, and number of evacuations. The data were computerized using an ATSDR-provided, Web-based data entry system.

A total of 947 events were reported. In 866 (91.5%) events, only one substance was released. The most commonly reported categories of substances were Acids, Volatile Organic Compounds, Other, Other Inorganic Substances, Ammonia, and Pesticides. During this reporting period, 111 events (11.7% of all reported events) resulted in a total of 241 victims, none of whom were fatalities. The most frequently reported injuries were Respiratory Irritation, Eye Irritation, Gastrointestinal Problems, and Skin Irritation. A total of 4,619 persons were ordered to evacuate (or self-evacuated) during 49 (5.2%) of the 947 total events.

HAZARDOUS SUBSTANCES EMERGENCY EVENTS SURVEILLANCE SYSTEM – 2002-2003 SUMMARY

INTRODUCTION

The Centers for Disease Control and Prevention defines surveillance as…
…"ongoing, systematic collection, analysis, and interpretation of health data essential to the planning, implementation, and evaluation of public health practice, closely integrated with the timely dissemination of these data to those who need to know. The final link of the surveillance chain is the application of these data to prevention and control. A surveillance system includes a functional capacity for data collection, analysis, and dissemination linked to public health programs" [1].

Since 1990, ATSDR has maintained the active, state-based Hazardous Substances Emergency Events Surveillance (HSEES) system to describe the public health consequences of releases of hazardous substances. The decision to initiate a surveillance system of this type was based on a study published in 1989 about the reporting of hazardous substances releases to three national databases: the National Response Center Database, the Hazardous Material Information System (HMIS), and the Acute Hazardous Events Database [2]. A review of these databases indicated limitations. Many events were missed because of specific reporting requirements (for example, the HMIS did not record events involving intrastate carriers or fixed-facility events). Other important information was not recorded, such as the demographic characteristics of victims, the types of injuries sustained, and the number of persons evacuated. As a result of this review, ATSDR implemented the HSEES system to more fully describe the public health consequences of releases of hazardous substances.

HSEES has four goals:

- To describe the distribution and characteristics of acute hazardous substances releases;
- To describe morbidity and mortality among employees, responders, and the general public that resulted from hazardous substances releases;
- To identify risk factors associated with the morbidity and mortality; and
- To identify strategies that might reduce future morbidity and mortality resulting from the release of hazardous substances.

For a surveillance system to be useful, it must not only be a repository for data, but also useful to protect public health. In the last few years, the fourth goal of the HSEES system has been emphasized, that is, to develop strategies to reduce subsequent morbidity and mortality by having each participating state analyze its data and develop appropriate prevention outreach activities. These activities are intended to provide industry, responders, and the general public with information that can help prevent chemical releases and reduce morbidity and mortality if a release occurs.

This report provides an overview of HSEES for 2002-2003 in Wisconsin, summarizes the characteristics of acute releases of hazardous substances and their associated public health consequences, and demonstrates how data from the system are translated into prevention activities to protect public health.

METHODS

Beginning in 2002, an updated data-collection form, approved by the Office of Management and Budget, went into effect. For each event, information was collected about the event, substance(s) released, victims, injuries, and evacuations.

Various data sources were used to obtain information about these events. State of Wisconsin sources included, but were not limited to, the Department of Natural Resources (DNR); Department of Agriculture, Trade and Consumer Protection (DATCP); WI Emergency Management (WEM); and the Division of Criminal Investigation/Narcotics Bureau (DCI/NB). Federal data sources included the U.S. Department of Transportation/Hazardous Material Information System (U.S.DOT/HMIS) and the National Response Center (NRC). Census data were used to estimate the number of residents in the vicinity of the events. All data were computerized using a Web-based data entry system provided by ATSDR.

HSEES defines hazardous substances emergency events as uncontrolled or illegal releases or threatened releases of hazardous substances. Events involving releases solely of petroleum are not included. Events are included if (1) the amount of substance released (or that might have been released) needed (or would have needed) to be removed, cleaned up, or neutralized according to federal, state, or local law; or (2) release of a substance was threatened, but the threat led to an action (for example, evacuation) that could have affected the health of employees, emergency responders, or members of the general public. HSEES defines victims as people who suffer at least one adverse health effect within 24 hours of the event or who die as a consequence of the event. Victims who receive more than one type of injury are counted once in

each applicable injury type. Events are defined as transportation-related if they occur during surface, air, pipeline, or water transport of hazardous substances, or before being unloaded from a vehicle or vessel. All other events are considered fixed-facility events.

For the data analyses in this report, the substances released were placed into categories. The category "Mixture" comprises substances from different categories that were mixed before the event, and the category "Other Inorganic Substances" comprises all inorganic substances, except acids, bases, ammonia, and chlorine.

RESULTS

For 2002-2003, 947 hazardous substances emergency events were reported to the Wisconsin HSEES Program: 131 (13.8%) of these events were threatened releases. A total of 458 (48.4%) occurred in fixed facilities. For each fixed-facility event, one or two types of area involved in the release can be selected. Of the total 458 fixed-facility events, a single area-type was selected for each event. The six most frequently reported area-types were Indoor, Non-Industrial, Living (residence) areas, 141 (30.8%); Storage (area) Above Ground, 68 (14.8%); Other (area types) 55 (12.0%); Piping, 45 (9.8%); Outdoor, Non-Farming, Non-Industrial areas, 45 (9.8%); Indoor, Non-Industrial, Non-Living areas, 36 (7.9%); and Outdoor, Farming or Industrial areas, 34 (7.4%) (Figure 1). Of the 489 transportation-related events, 469 (95.9%) occurred during ground transport (e.g., truck, auto, van, or tractor) and 20 (4.1%) involved transport by other modes of transportation, e.g., rail 17 events, 3.5%, boat, airplane, or pipeline (Figure 2). The largest proportion of transportation-related events occurred during unloading of a stationary vehicle or vessel, 353 (72.2%); from a moving vehicle or vessel, 99 (20.3%); or from a moving vehicle not discovered until unloading, 31 (6.3%).

Primary contributing factors were reported for all events in the period. Among the 947 total events (both fixed and transportation events), the primary contributing factors by order of frequency were: Operator Error, 499 (52.7%); Equipment Failure, 272 (28.7%); Intentional, 169 (17.9%); and Natural Disaster, 6 (<1%). Among fixed facility events only, Operator Error, 186 (40.6%) ; Intentional (deliberate damage), 141 (30.8%); Equipment Failure, 124 (27.1%); and Other (including natural disasters and severe weather), 7 (1.5%) were primary contributing factors (Figure 3). Among transportation events only, Operator Error, 313 (64.0%); Equipment Failure, 148 (30.3%); and Intentional, 28 (5.7%) were the primary contributing factors.

Of the 947 total events (both fixed-facility and transportation-related), 866 events (91.4%) involved the release of only one substance. Two or more substances were released in the remaining 81 events, 8.5% of total events (Table 1). Of the 458 total fixed-facility events, 68 (14.8%) involved the release of two or more substances. Of the total 489 transportation-related events, only 13 (2.7%) involved two or more substances.

A total of 1,149 substances were either released or threatened to be released during this two-year period. For each released substance, one or two release-types (e.g., spill, air, fire, etc.) could be reported. Of the total 1,149 substances with type of release reported, one release-type was associated with the following: Spills, 675 (58.8%); air releases, 135 (11.8%); and fires 11 (<1.0%). Two release-types were reported for the following combinations: spill and air releases,

19 (1.7%) and fires and explosions, 3 (<1%). The remainder involved other combinations of release-types, or unknown release-types.

For the period of this report, the number of events by month ranged from a high of 131 (13.8 %) during the July months to a low of 46 (4.9 %) during the February months. The largest proportion of events, 514 (54.3%) occurred during the five months from April through August, reflecting increased activity in the agricultural, recreational, and construction sectors of the Wisconsin economy. For all the days of the week and all events, the proportion of events ranged from a high of 204 (21.5%) on Tuesdays to a low of 65 (6.9%) on Sundays. Weekdays accounted for 809 (85.4%) of total events. There were 138 events that occurred on weekend days (Sat/Sun) which represented 14.6% of total events. Of the 506 (53.4%) events for which time of day (or time category) was reported, 185 (36.6%) occurred from 6:00 a.m. to 11:59 a.m.; 172 (34.0%) from 12:00 p.m. to 5:59 p.m.; and 92 (18.2%) from 6:00 p.m. to 11:59 p.m., with the remainder occurring during the early hours of the day.

Industries

Among the 16 pre-designated industry categories established for this report, the largest proportion of HSEES events by far occurred in the Transportation industry, 428 (45.3 % of total events), followed by Personal Services, 158 (16.8%); Manufacturing 113 (11.9%); and Agriculture 88, (9.3%), and the Unspecified/Unknown category 61 (6.4%). Events placed in the Transportation category were those that occurred while on a vehicle (plane or vessel); excepting those that occurred in the agricultural sector, which were more properly accounted for in a separate category. The events in the Personal Services category include those reported (on a pilot basis) by the Wisconsin Poison Control Center (WPCC), along with those having to do with illicit methamphetamine laboratories which could not be categorized elsewhere.

The largest proportion of events with victims occurred in the Personal Services category, 55 (49.6%) of the 111 total events with victims; followed by Manufacturing and Transportation, each category reporting 12 events with victims (10.8%). It is noteworthy that the Transportation category with 428 events (45.3% of total events), included 12 events associated with 21 victims; while the 113 events in the Manufacturing category (11.9% of total events), included 12 events associated with 55 victims. Also of note, the large number of events with victims, 55 (49.6% of total events with victims) in the Personal Services category is mainly the result of including Wisconsin Poison Control Center reports which contain a much higher victim/event ratio than other reporting sources such as the Department of Agriculture or the Department of Natural Resources (Table 2).

Substances

A total of 1,149 substances were involved in all events, of which 294 substances (25.6 %) were reported as threatened releases in 131 (13.8%) of the 947 total events. The three most frequently released substances were Ammonia, Corrosive NOS, and Hydrochloric Acid (Appendix A). All released substances were grouped into categories. According to the frequency of substance names released, the three categories most commonly involved in fixed-facility events were Ammonia 100 (15.6% [of total substances released in fixed facilities]); Other

Inorganic Substances, 100 (15.6%); and Acids, 97 (15.2%). The three categories most commonly involved in transportation-related events were Volatile Organic Compounds, 88 (17.3%); Other, 82 (16.1%), and Acids, 78 (15.3%) (Table 3).

Victims

A total of 241 victims were involved in 111 events (11.7% of total events for the period) (Table 4). Of the 111 events with victims, 89 (80.2%) involved only one victim and 22 (19.8%) involved two or more victims. Of the total 241 victims, 222 (92.1%) were injured in fixed-facility events, while 19 persons (7.9%) were injured in transportation-related events. In addition, fixed-facility events were more likely to have more than one victim per event (17, 15.3%) than were transportation events (5, 4.5%).

To represent the magnitude of the effects of substances involved in injuries, the number of events in a specific substance category was compared with the number of events in the same category that had victims. Substances in events that involved one or more substances from the same substance category were counted once in that category. Substances in events that involved two or more substances from different categories were counted once and placed in the a separate category, e.g., Multiple Substance Categories. Substances released most often were not necessarily the most likely to result in victims. For example, events involving the substance category Volatile Organics constituted 10.9 % of all events, with less than 1% of these events resulting in injury. Conversely, events involving the substance category Chlorine constituted 3.9% of total events, but resulted in 19.8% of the 111 total events with victims (Table 5).

Among victim categories for all events (fixed-facility and transportation-related), General Public, 117 (48.6 %), constituted the largest proportion of the population groups injured, followed by Employees, 102 (42.3 %); Responders, 16 (6.6%); and Students, 6 (2.5%) (Figure 4). Twelve emergency response personnel were injured in fixed-facility events. Of those, 8 (66.7%) were Career Firefighters; 3 (25.0%) were Police Officers, and 1 (8.3%) was a Responder/Unknown type (Figure 5a). Four emergency-responder victims were injured in transportation-related events. Of these, 3 (75.0%) were Police Officers (Figure 5b). Fixed-facility events accounted for 92.1% of victims among the six known victim categories.

Reflecting the fact that some victims may suffer more than one injury (type) or symptom, a total of 401 injuries were sustained by the 241 total victims over the two-year period (Figure 6). Fixed-facility events accounted for 366 injuries (91.3% of total injuries), while transportation-related events accounted for just 35 injuries (8.7% of total injuries). Among fixed-facility events, the most common injury types were Respiratory Irritation, 128 instances (35.0%); Eye Irritation, 57 (15.6%); Gastrointestinal System, 55 (15.0%); Skin Irritation, 41 (11.2%); Central Nervous System (CNS) Symptoms, 33 (9.0%); Headache, 33 (9.0%); and Chemical Burns, 11 (3.0%). Among transportation-related events, the most common injury types were Respiratory Irritation, 14 instances (40.0%); Eye Irritation, 13 (37.1%); Skin Irritation, 6 (17.1%); concluding with Chemical Burns and CNS Symptoms, one each (2.9%) (Table 6).

Gender was known for all of the total 241 victims; of these 136 (56.4%) were male, 105 (43.6%) female. Among victim categories, males constituted 67.8% of victims classified as Employees and Responders, but in the General Public and Student categories, 54.5% of the victims were female. Twenty-eight years was the median age of the 121 (50.2%) victims (both genders) for whom age was reported (known); the range of ages was 2-83 years; and the mean age for both genders was 30.3 years. Of the 121 victims with known ages, 9 were children (among the General Public) aged <10 years; and 18 were children aged 10─18 years becoming symptomatic as Employees, in the General Public or while Students at school. For the 120 (49.8%) injured persons for whom age was not reported, 77 (64.2%) were presumably adults (Responders and Employees), 3 (2.5%) were Students, and 40 persons (33.3%) were members of the General Public at the time of exposure. Among the 241 total victims for the period, the frequency of victim-dispositions was as follows: Transported/Not Admitted, 125 persons (51.9%); Injuries Reported Within 24 Hours, 50 (20.8%); Treated On Scene, 35 (14.5%); Transported/Admitted, 14 (5.8%); Seen By Private Physician (within 24 hours), 10 (4.2%); and Transported For Observation, 7 (2.9%). There were no fatalities for the two-year period (Figure 7).

The use-status of personal protective equipment (PPE) was known for all but two of the 241 total victim categories. Among the 117 General Public victims, 114 (97.4%) of them wore no PPE. Of the 102 Employee victims, 98 (96.1%) wore no PPE; 4 (3.9%) wore Level-A gear as part of an in-house response team. None of the 6 Student victims wore any form of PPE. Among the 16 responder victims for the period, 9 were Professional Firefighters, of whom 4 (44.4%) sustained injury while wearing firefighter turnout gear with respiratory protection; 2 (22.2%) were reported as wearing no PPE; 1 (11.1%) wore firefighter gear without respiratory protection; one each wore Level-A or Level B gear; and 1 whose PPE status was unknown. None of the 6 Police Officer victims were reported to have worn any form of PPE at the time of their exposure.[a]

Of the 111 events with victims, 89 events (80.2%) involved one victim, while 22 events (19.8%) were associated with 2 or more victims. Some examples of single events with multiple victims include 38 persons who became symptomatic while shopping at a retail outlet after fumes from the inappropriate mixing of cleaning chemicals vented into the store; 22 employees who became symptomatic when equipment failure resulted in the release of carbon monoxide; and 10 employees becoming symptomatic when a vessel overheated releasing toluene and diisocyanate.

EVACUATIONS

Evacuations were ordered in 43 events, 4.5% of the total 947 events for the period. The type or extent of the evacuation was reported for each of the 43 ordered evacuations, as follows:

[a] Note: Firefighter turn-out gear is protective clothing normally worn by firefighters during structural fire-fighting operations and is similar to level "D" protection. Level "D" as defined by the Occupational Safety and Health Administration is coveralls, boots/shoes (leather of chemical resistant, steel toe and shank), safety glasses or chemical splash goggles, and hard hat. Level "D" provides limited protection against chemical hazards.

Building (or affected part of a building), 25 (58.1%); No Type reported, 11 (25.6%); Downwind/Downstream, 4 (9.3%); and Circle Radius/Circle Downwind, 3 (7.0%). The number of people evacuated was known for 42 of the 43 events with ordered evacuations, and for a single event ranged from low of 3 persons to a high of 1,500, with the median being 35. The median length of an ordered evacuation was 2 hours. In 42 evacuations (97.7% of events for which evacuation was ordered), access to the area was restricted. During 8 events, where it could not be established if an evacuation had been ordered, 243 persons self-evacuated. In-place sheltering was ordered by an official during 8 events over the two-year period.

RESPONSE

A single event could, and often did, involve combinations of responding personnel types or organizations. States could report up to 10 categories of who responded to the event. At least one response category was reported for 937 (98.9%) of events. Of the total 947 events for the period, 824 (87.0%) had 1 category of response reported, 91 (9.6%) had 2 categories reported, and 22 (2.3%) involved 3 or more response categories.

*The distribution of the 10 response categories are as follows:

Company's response team	61.0%
Law enforcement agency	21.7%
Fire Department	11.5%
Hospital personnel	8.5%
Certified HazMat team	7.9%
EMT	2.4%
Environmental agency	1.2%
Health Department	0.2%
'Other'	0.0%
EPA response team	0.0%

* Percentages sum to greater than 100% because an event can report multiple response categories.

PREVENTION ACTIVITIES

During 2002-2003 the Wisconsin HSEES Program performed various prevention activities. For 2002 these activities included:

- Ammonia Poster Exhibit at the Governor's Conference On Emergency Management
- Swimming Pool Chemicals Phone Outreach With Follow-up Evaluation Questionnaire
- PowerPoint Presentation To WI Level-A Regional Coordinators and Fire Chiefs
- Collaborative Poster Exhibit With the WI PCC Presented at the North American Congress of Clinical Toxicology Annual Conference.

During 2003 prevention/outreach activities included:

- Collaborative HSEES/OSHA Ammonia PowerPoint Presentation For Milwaukee Steamfitters Local 601

- Chlorine Poster Exhibit at the WI Water Association (WWA) 82nd Annual Conference
- Establish a WI HSEES Web Page Presence on the WI Department of Health and Family Services (DHFS) Web Site
- Disseminate The WI HSEES 4-Year Cumulative Report (1998-2001)

The Wisconsin HSEES Internet website page is available on the Wisconsin DHFS website at http://dhfs.wisconsin.gov/eh/hsees/. From this site, annual reports and other information can be viewed and downloaded. On a somewhat restricted basis, WI HSEES information is also available on the WI Health Alert Network (HAN) at https://www.han.wisc.edu/

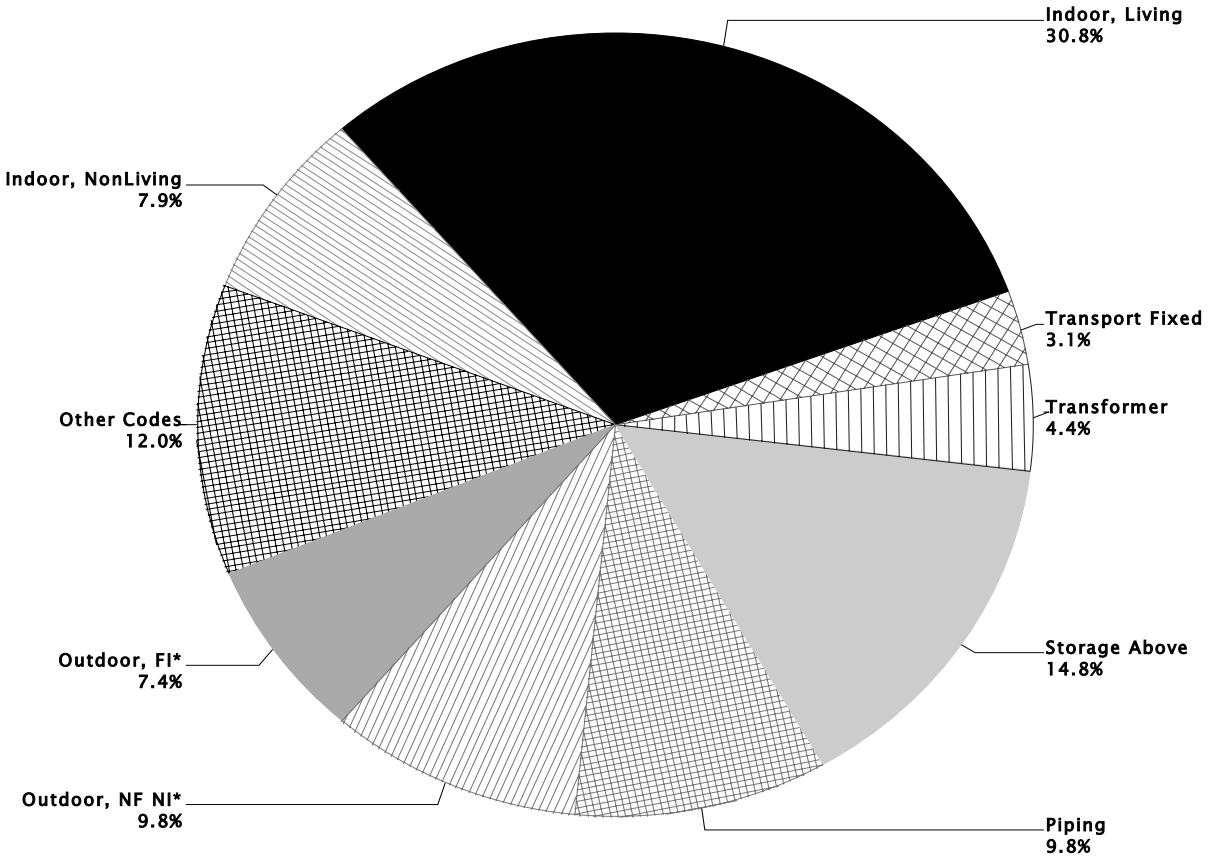
WISCONSIN HSEES PROGRAM, SUMMARY OF RESULTS, 1993-2003

For the 11-year period, there were a total of 4,700 hazardous material events reported to the Wisconsin HSEES Program; the average annual number being approximately 427. For the period, 2,558 (54.4%) of the events were associated with fixed facilities; while 2,142 (45.6%) were transportation-related events. Beginning with 1999, however, there has been an increase in the number of transportation-related events partially due to the utilization of the U.S. DOT/HMIS as a primary notification source for transportation events. For the period, the annual number of events with victims has been relatively consistent, with only 2 years at less than 28 events, and only one year (2002) with more than 34 events with victims. Note: during 2002, the Program (on a pilot basis) was receiving exposure/spill reports from the Wisconsin Poison Control Center which contained a much higher victim/event ratio than other reporting sources (Table 7). Among victim types, Employees were the group most frequently effected by hazardous materials releases, except for 1998 and 2002 when a large number of students and persons in the general public (respectively) became victims during single events (Figure 8). Reflecting the fact that a single event can involve the release of more than one substance, there were a total of 4,994 substances released during the 4,700 total events for the period (Figure 9).

Data over the 11-year period, especially the relatively consistent number of victims and events with victims, strongly suggests that prevention/outreach activities associated with ongoing surveillance be continued and strengthened. In response to frequent events involving ammonia (approximately 12% of total events over time), outreach activities in each of the last two years (02-03) have addressed ammonia releases in the workplace. Similarly, workers at swimming pools have been recognized as outreach clients because of the high incidence of victims and evacuees during chlorine releases.

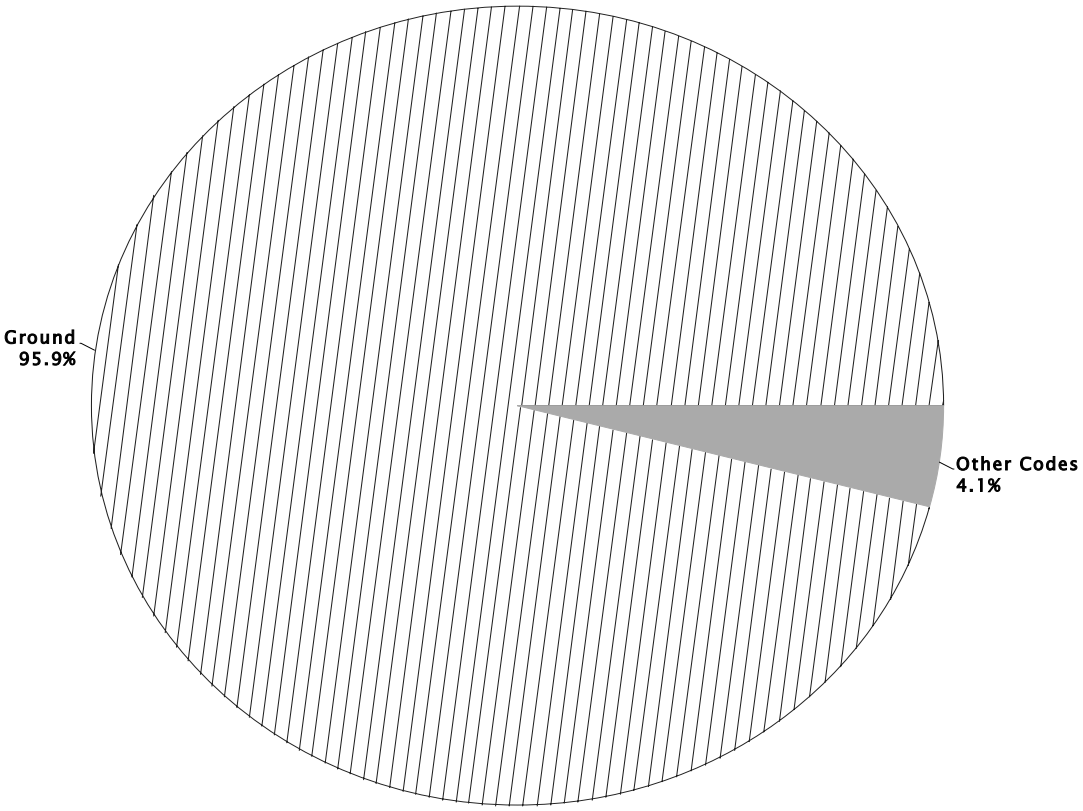
FIGURES AND TABLES

Figure 1.--Areas of fixed facilities involved in events, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003.



* (FI) Outdoor Farming/Industrial
(NF NI) Outdoor Non-farming/Non-industrial

Figure 2.—Distribution of transportation-related events by type* of transport, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003.



* Note: "Ground" transport refers to events that occurred while substances were onboard trucks, automobiles, vans; "Other Codes" includes 17 railroad events, 3.5% of the total 489 transportation events for the period.

Figure 3.—Factors reported as contributing to the occurrence of fixed-facility events, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003.

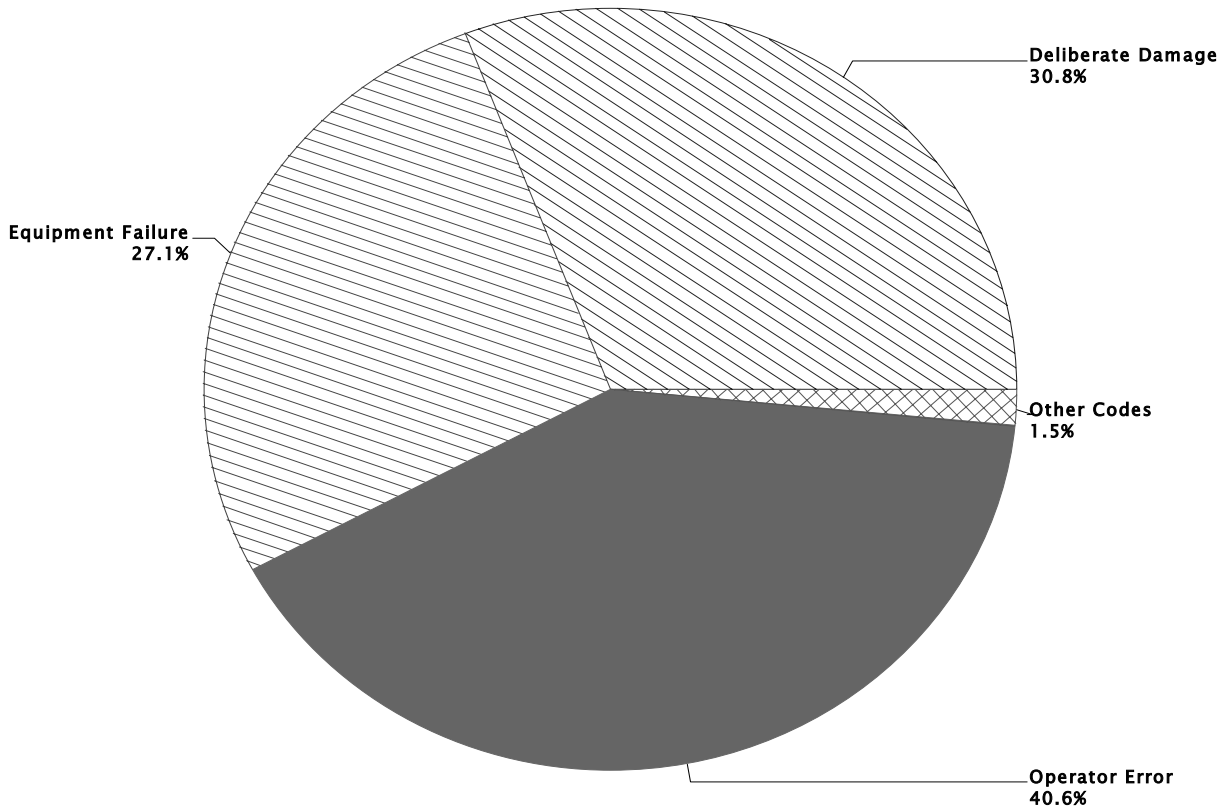


Table 1.-Number of substances involved per event, by type of event, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003.

No. of Substances Released	Type of Event						All Events		
	Fixed Facility			Transportation					
	No. Events	%	Total Substances	No. Events	%	Total Substances	No. Events	%	Total Substances
1	390	85.1%	390	476	97.3%	476	866	91.4%	866
2	21	4.6%	42	7	1.4%	14	28	3.0%	56
3	8	1.7%	24	4	0.8%	12	12	1.3%	36
4	25	5.5%	100	2	0.5%	8	27	2.8%	108
_> 5	14	3.1%	83	0	0.0%	0	14	1.5%	83
Total	**458**	**100.0%**	**639**	**489**	**100.0%**	**510**	**947**	**100.0%**	**1,149**

Table 2.—Industries involved in hazardous substances events, by category, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003.

Industry Category	Total Events		Events with Victims		Percentage All Events with Victims	Total No. Victims (Range)*
	No.	%	No.	%		
Agriculture	88	9.3%	2	2.3%	1.8%	7 (R=5)
Mining	1	0.1%	0	0.0%	0.0%	0 (R=0)
Construction	5	0.5%	0	0.0%	0.0%	0 (R=0)
Manufacturing	113	11.9%	12	10.6%	10.8%	55 (R=22)
Transportation	428	45.3%	12	2.8%	10.8%	21 (R=3)
Communications	0	0.0%	0	0.0%	0.0%	0 (R=0)
Utilities	43	4.5%	0	0.0%	0.0%	0 (R=0)
Wholesale Trade	4	0.4%	1	25.0%	0.9%	1 (R=1)
Retail Trade	7	0.7%	6	85.7%	5.4%	43 (R=38)
Finance/Real Estate	2	0.2%	1	50.0%	0.9%	1 (R=1)
Business/Repair Services	3	0.3%	0	0.0%	0.0%	0 (R=0)
Personal Services	158	16.8%	55	34.8%	49.6%	67 (R=9)
Entertainment/Recreation	11	1.2%	4	36.4%	3.6%	14 (R=9)
Professional Services	18	1.9%	9	50.0%	8.1%	22 (R=10)
Public Administration	5	0.5%	0	0.0%	0.0%	0 (R=0)
Unspecified and Unknown	61	6.4%	9	14.8%	8.1%	10 (R=2)
Total	**947**	**100%**	**111**	**N/A**	**100%**	**241**

*Range of number of victims per event with victims.

Table 3.—Number* of substances involved, by substance category and type of event, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003.

Substance Category	Type of Event				All Events	
	Fixed Facility		Transportation			
	No. Substances	%	No. Substances	%	No. Substances	%
Acids	97	15.2%	78	15.3%	175	15.2%
Other†	55	8.6%	82	16.1%	137	11.9%
Mixture‡	53	8.3%	19	3.7%	72	6.3%
Ammonia	100	15.6%	15	2.9%	115	10.0%
Bases	22	3.4%	33	6.5%	55	4.8%
Chlorine	33	5.2%	8	1.6%	41	3.6%
Other Inorganic Substances¶	100	15.6%	36	7.1%	136	11.8%
Paints & Dyes	11	1.7%	38	7.5%	49	4.3%
Pesticides	27	4.2%	65	12.7%	92	8.0%
Polychlorinated Biphenyls	16	2.5%	2	0.4%	18	1.6%
Volatile Organic Compounds	83	13.0%	88	17.3%	171	14.9%
Formulations	1	0.2%	0	0.0%	1	0.1%
Hetero-Organics	3	0.5%	4	0.8%	7	0.6%
Hydrocarbons	10	1.6%	1	0.2%	11	1.0%
Oxy-Organics	24	3.8%	17	3.3%	41	3.6%
Polymers	4	0.6%	24	4.7%	28	2.4%
Total	**639**	**100.0%**	**510**	**100.0%**	**1,149**	**100.0%**

*A single event may involve the release of more than one substance, hence the number of substances exceeds the number of events.
† Not classified.
‡Substances from different categories that were mixed prior to the event.
¶All inorganic substances except for acids, bases, ammonia and chlorine.

Table 4.—Frequency of the number of victims by type of event, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003.

No. Victims	Type of Event						All Events		
	Fixed Facility			Transportation					
	No. of Events	%	Total Victims	No. Events	%	Total Victims	No. Events	%	Total Victims
1	83	83.0%	83	6	54.5%	6	89	80.2%	89
2	3	3.0%	6	2	18.2%	4	5	4.5%	10
3	3	3.0%	9	3	27.3%	9	6	5.4%	18
4	1	1.0%	4	0	0	0	1	0.9%	4
5	3	3.0%	15	0	0	0	3	2.7%	15
≥ 6	7	7.0%	105	0	0	0	7	6.3%	105
Total	**100**	**100.0%**	**222**	**11**	**100.0%**	**19**	**111**	**100.0%**	**241**

Table 5.—Frequency of substance categories in all events and events with victims, Wisconsin Hazardous Substances Emergency Events Surveillance System, 2002-2003.*

Substance Category	All Events		Events with Victims		
	No.	%	No.	Percentage of All Releases with Victims	Percentage of Events with Victims in Substance Category
Acids	116	12.2%	11	9.9%	9.5%
Other†	120	12.7%	1	0.9%	0.8%
Mixture‡	69	7.3%	35	31.6%	50.7%
Ammonia	82	8.7%	22	19.8%	26.8%
Bases	41	4.3%	0	0.0%	0.0%
Chlorine	37	3.9%	22	19.8%	59.4%
Other Inorganic Substances¶	76	8.0%	6	5.4%	7.9%
Paints and Dyes	47	5.0%	0	0.0%	0.0%
Pesticides	81	8.5%	3	2.7%	3.7%
Polychlorinated Biphenyls	18	1.9%	0	0.0%	0.0%
Volatile Organic Compounds	103	10.9%	1	0.9%	1.0%
Multiple Substance Categories	81	8.5%	4	3.6%	4.9%
Formulations	1	0.1%	0	0.0%	0.0%
Hetero Organics	7	0.7%	2	1.8%	28.6%
Hydrocarbons	10	1.1%	0	0.0%	0.0%
Oxy-Organics	31	3.3%	4	3.6%	12.9%
Polymers	27	2.9%	0	0.0%	0.0%
Total	**947**	**100.0%**	**111**	**100.0%**	**11.7%**

*Substances in events that involved multiple substances were counted only once in a substance category when all the substances were associated with the same category. If they were events that involved multiple substances from different substance categories they were counted only once in the Multiple Substance Category. Thus, 33 events that involved ammonia, along with one or more other substances, were placed in the Multiple substances category. For the 2-year period there were 115 events during which ammonia was released, or threatened to be released (see Table 3).

†Not classified.

‡Substances from different categories that were mixed prior to the event.

¶All inorganic substances except for acids, bases, ammonia, and chlorine.

Figure 4.—Distribution of victims by population group and type of event, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003.

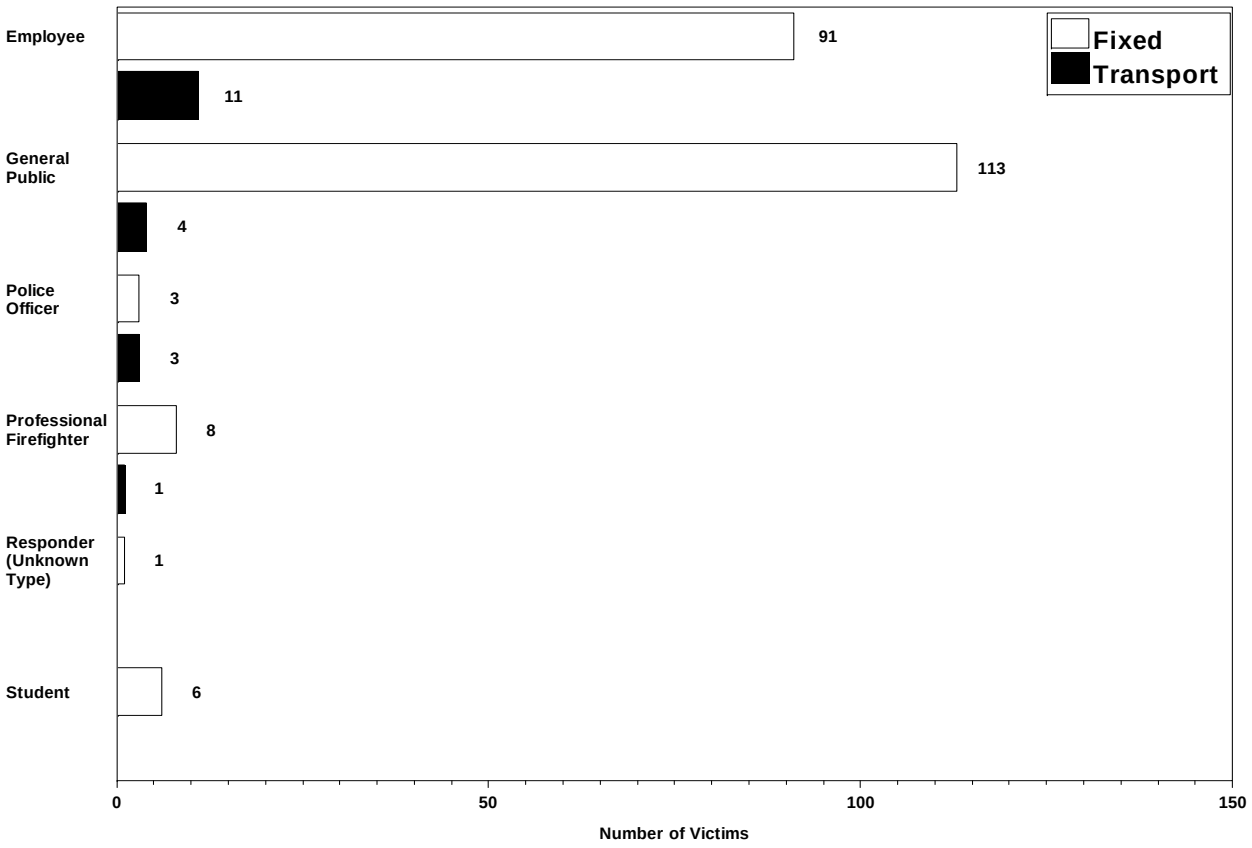
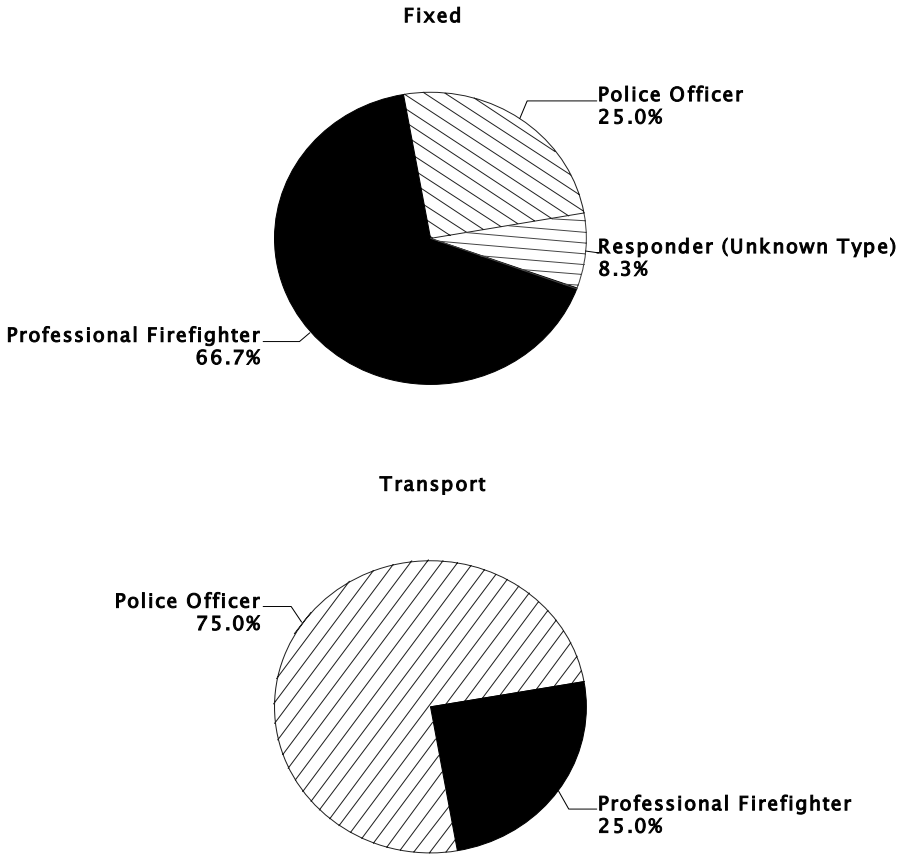


Figure 5.—Distribution of responder victims* by population group and type of event, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003.



* Of the 12 total responder victims, 8 of them were injured in fixed facility events, 4 in transportation-related events.

Figure 6.—Distribution of type of injury for all events, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003.

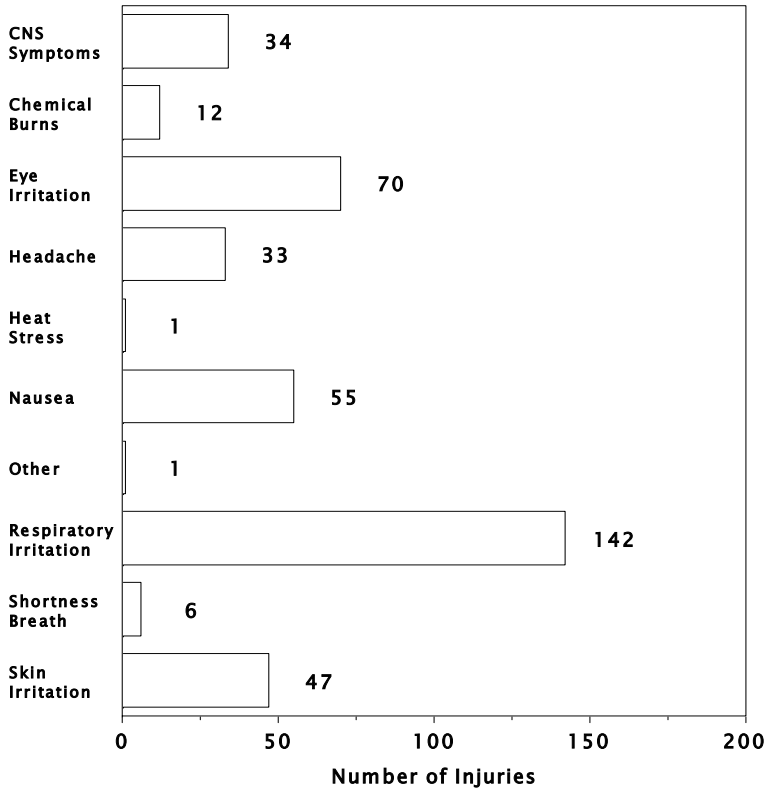


Table 6.─Frequencies of injuries/symptoms*, by type of event, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003.

Injury/Symptom	Fixed Facility		Transportation		All Events	
	No. Injuries	%	No. Injuries	%	Total No.	%
Trauma	0	0.0%	0	0.0%	0	0.0%
Respiratory Irritation	128	35.0%	14	40.0%	142	35.4%
Eye Irritation	57	15.6%	13	37.1%	70	17.5%
Gastrointestinal System	55	15.0%	0	0.0%	55	13.7%
Heat Stress	1	0.3%	0	0.0%	1	0.2%
Chemical Burns	11	3.0%	1	2.9%	12	3.0%
Other	1	0.3%	0	0.0%	1	0.2%
Skin Irritation	41	11.2%	6	17.1%	47	11.7%
Dizziness/CNS (Central Nervous System)	33	9.0%	1	2.9%	34	8.6%
Headache	33	9.0%	0	0.0%	33	8.2%
Heart Problems	0	0.0%	0	0.0%	0	0.0%
Shortness of Breath	6	1.6%	0	0.0%	6	1.5%
Total	**366**	**100.0%**	**35**	**100.0%**	**401**	**100.0%**

*The number of injuries (401) is greater than the number of victims (241) because a single victim could have had more than one injury.

Figure 7.—Injury outcome, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003.

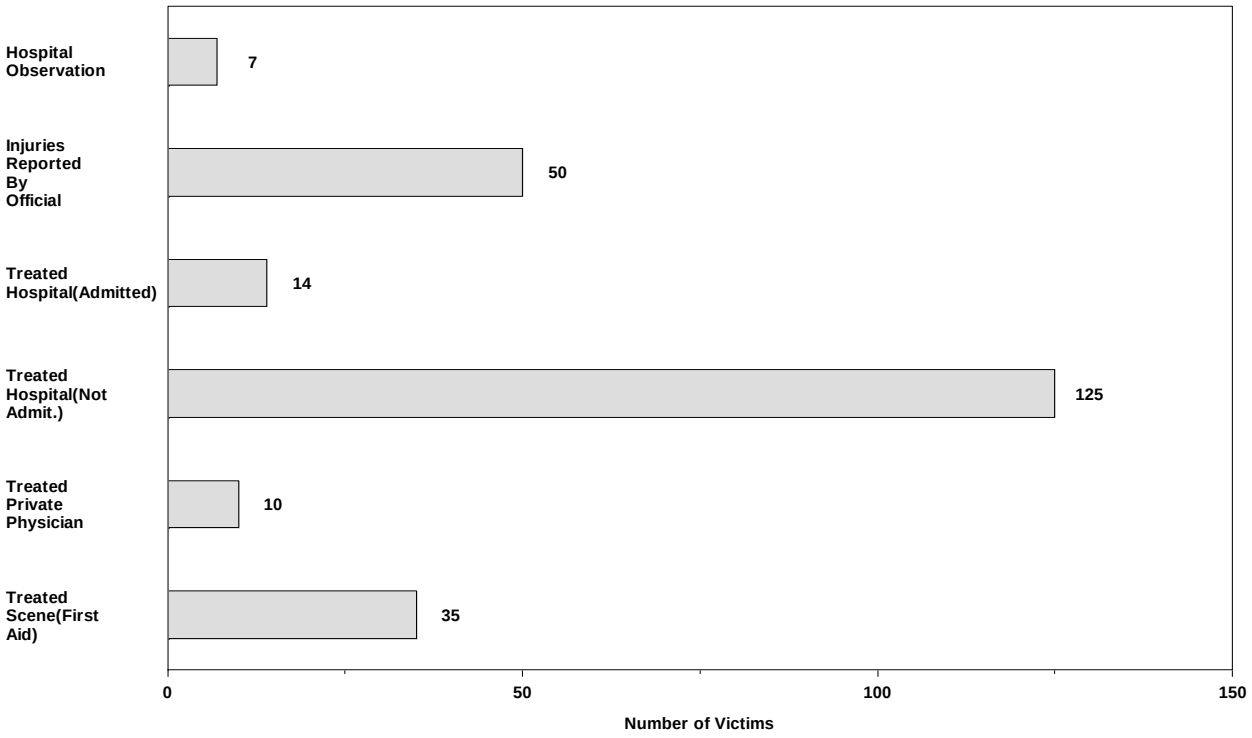


Table 7.— Cumulative data by year, Wisconsin Hazardous Substances Emergency Events Surveillance, 1993-2003.*

Year	Type of Event			No. Substances Involved	No. Victims	No. Deaths	Events with Victims	
	Fixed Facility	Transportation	Total				No.	%†
1993	290	60	350	359	61	1	29	8.3%
1994	223	175	398	466	77	0	30	7.5%
1995	283	125	408	420	71	0	19	4.7%
1996	211	120	331	334	92	0	21	6.3%
1997	216	134	350	350	125	0	34	9.7%
1998	218	205	423	423	174	0	32	7.6%
1999	238	269	507	507	159	1	28	5.5%
2000	199	279	478	478	137	2	31	6.5%
2001	222	286	508	508	144	1	30	5.9%
2002	273	264	537	550	154	0	80	14.9%
2003	185	225	410	599	87	0	31	7.6%
Total	**2,558**	**2,142**	**4,700**	**4,994**	**1,281**	**5**	**365**	**7.8%**

* Numbers in the table may differ from those reported in previous years because of adjustments in HSEES qualification requirements for events.

† Percentage of events with victims per calendar year.

Figure 8.--Distribution of victims, Wisconsin Hazardous Substances Emergency Events Surveillance, 1993-2003.

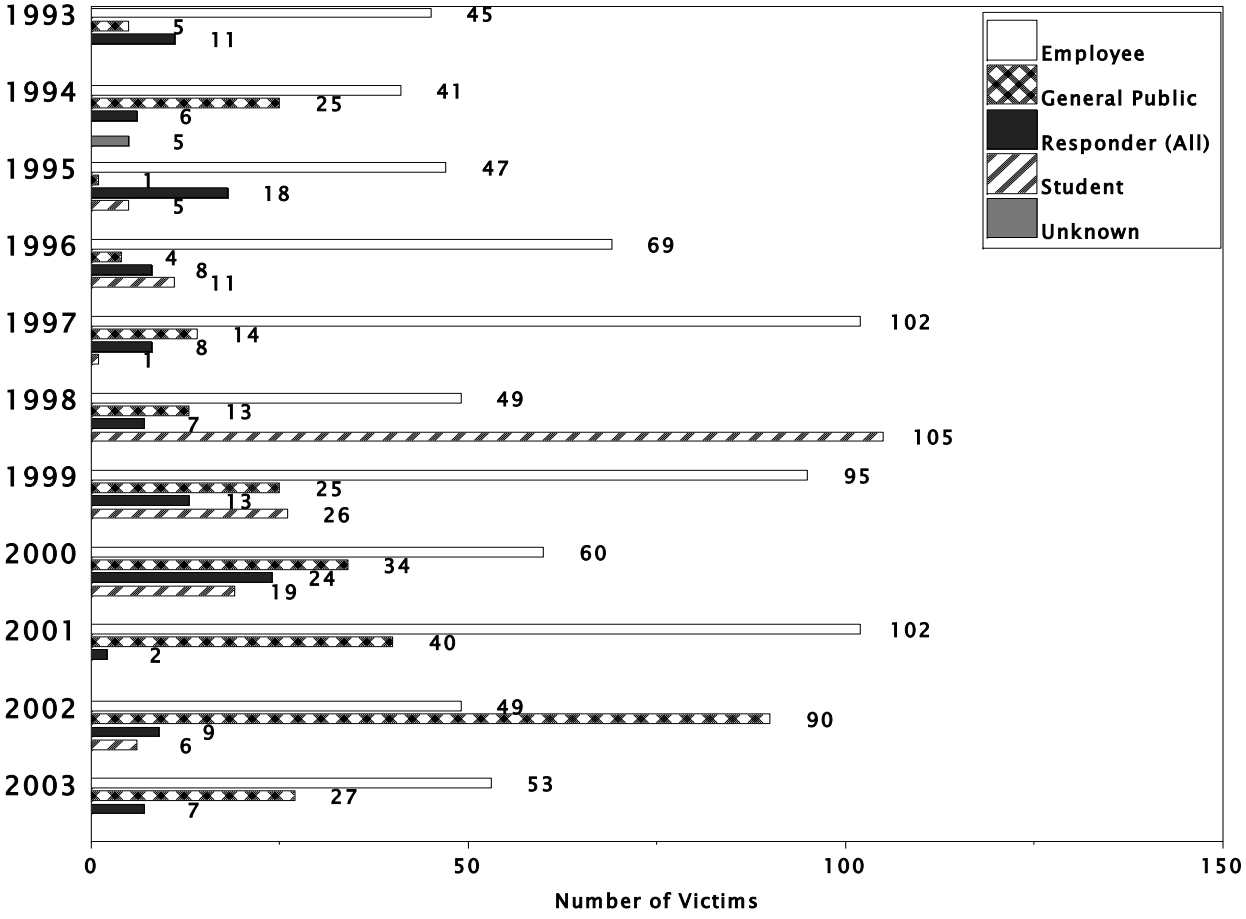
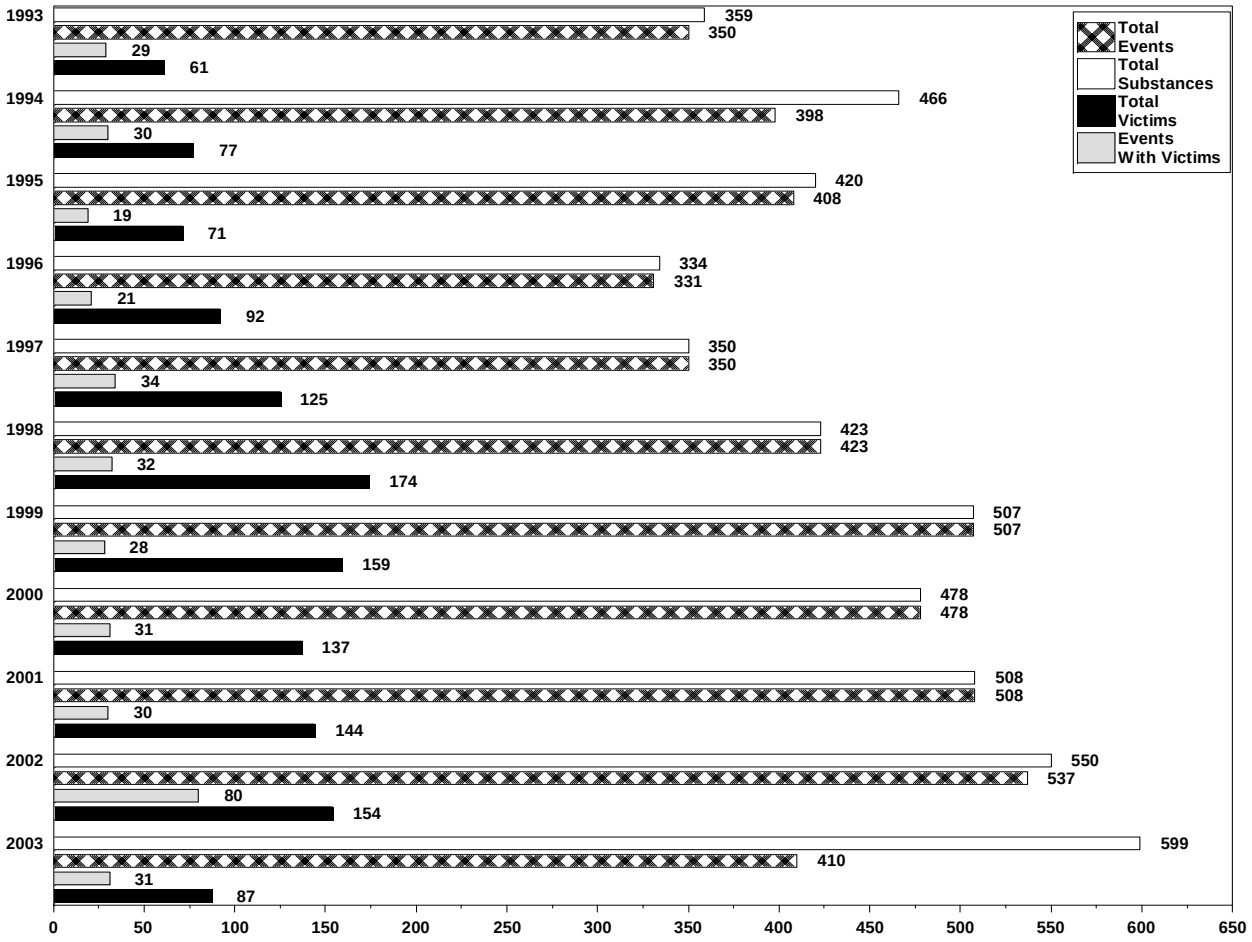


Figure 9.—Cumulative data (total events, total substances, total victims, and events with victims), Wisconsin Hazardous Substances Emergency Events Surveillance, 1993-2003.



REFERENCES

1. Centers for Disease Control and Prevention: Comprehensive plan for epidemiologic surveillance. Atlanta: US Department of Health and Human Services; (1986)

2. Binder S. Death, injuries, and evacuations from acute hazardous materials releases. Am J Public Health 1989; 70:1042-4.

APPENDICES

Appendix A. The 10 most frequent substances involved in events, Wisconsin Hazardous Substances Emergency Events Surveillance, 2002-2003

Number	Standardized Substance Name	Frequency
1.	Ammonia*	113
2.	Corrosive NOS	57
3.	Hydrochloric Acid	54
4.	Acid NOS	41
5.	Methamphetamine Chemicals NOS	39
6.	Sulfuric Acid	37
7.	Lithium	36
8.	Sodium Hydroxide	29
9.	Toluene	28
10.	Flammable Liquid NOS	27
	Total	461

* Note: Ammonia queries included the following substance names, only; "ammonia", and “anhydrous ammonia”; derivatives, such as ammonium compounds along with other combinations were not included. Substance names "ammonia" and "anhydrous ammonia" were detected in 113 events; "ammonia NOS", 1 event; and "ammonium sulfate", 1 event. When adding the latter two substance names, there were 115 ammonia events for the 2-year period as referenced in Table 3.